DOCUMENT RESUME

ED 084 311 TM 003 337

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TITLE Observations of School Learning.
PUB DATE 27 Aug 73
NOTE 11p.; Paper presented at Annual Meeting, American Psychological Association, Montreal, Canada, August 27, 1973

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Academic Achievement; Classroom Environment; *Classroom Observation Techniques; Instruction; *Learning; *Learning Processes; *Observation; Reinforcement; Teacher Behavior; Teacher Characteristics

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An observational study is described, not yet completed, of learning in school classrooms. Observations were made in a number of classes ranging from grade 1 to grade 12, including teaching in a variety of school subjects. The purpose of the study was to explore and refine a method for observing the events which support (or fail to support) learning. Such events were considered to fall in the broad categories of those which (1) introduce learning; (2) guide initial learning; (3) make learning memorable and generalizable; and (4) provide reinforcement. Observations were made of the learning of information, intellectual skills, attitudes, cognitive strategies, and motor skills. The method is contrasted with those having the purpose of observing modes of instruction, teacher behaviors, or teacher characteristics. The method is found to be feasible. Some generalizations are drawn about recurring observations in the classroom. (Author)

ED 084311

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Observations of School Learning

Robert M. Gagné

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TM 003 337

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Observations of School Learning

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(Presentation to Symposium, "The Bridge between the Learning Laboratory and the Classroom," Annual Meeting, American Psychological Association, Montreal, August 27, 1973.)

A prominent theme in investigations of school learning is the question of "what makes a difference in student achievement?" There are several varieties of approach to this problem. Several years ago, J. M. Stephens (1967) summarized evidence from school studies of approaches to instruction which led him to the conclusion that almost nothing had been shown to make a difference. Around the same time, the Coleman Report (Coleman et al., 1966), indicated that many kinds of measurable variables such as class size, teacher-pupil ratio, teacher experience, and so on were not related to school outcomes of student abilities. Over the past several years, there have been many studies seeking to measure relationships of teacher characteristics with student achievement, teacher behaviors with student achievement, and teacher skills with student achievement, which have been reviewed and summarized by Rosenshine (1971) and Rosenshine and Furst (1973). As these authors point out, an almost bewildering variety of independent variables has been proposed in these studies, and a few of them, indeed, have been shown to have small but significant relationships with student achievement measures.

One can surely agree wholeheartedly with the suggestion made by Rosenshine and Furst that what is needed in dealing with the question "what makes a

difference?" is not more correlational studies, but well-designed experimental studies. Finding correlations can perhaps be a way of revealing promising variables in teacher behaviors or teaching strategies, but they will probably remain unconvincing in any ultimate sense until we have evidence that changes in such variables are causally related to changes in student abilities or achievements.

Even supposing that experimental studies should be encouraged and will be conducted, there remains the possibility that the truly critical independent variables have not yet been identified. Such a statement should be made with humility and trepidation. After all, scores of studies of the question "what makes a difference" have been conducted because the investigators viewed other people's independent variables as inadequate, and wished to propose some new and different ones. Despite these considerations, this is the position I am inclined to take. I suggest that the "right" variables have not as yet been identified or observed.

Events in Support of Learning

The observational study I have undertaken, which is as yet unfinished, has been based upon the idea that what should be observed as variables which may "make a difference" are those events which support (or fail to support) learning. As broad categories of such events, useful perhaps only for purposes of the present communication, the following types are suggested:

(1) Events which introduce, or set the stage for, learning. Such activities as capturing student interest and directing student attention fall in this category.

(2) Events which guide the initial learning process. These would include verbal explanations, prompts and hints, leading questions, and the like.

(3) Events which are designed to make what is learned memorable and generalizable -- that is, which support retention and transfer. Review questions and elaborations would be included here.

(4) Events which effect reinforcement. Falling in this category would be instances of appraisal of student performance, and the feedback which follows. These might occur in the form of teacher questions, quizzes, or student papers and the comments made on them.

My reasons for proposing that these events may have important effects on student achievement are not difficult to explain. Changes in student achievement are causally affected by the amount of learning they are able to accomplish, and perhaps also by the "quality" of the learning (assuming this term can be suitably defined). Some student learning is self-instructional. The remainder of it may be influenced by instruction, whose purposes are implied by the four categories of events I have mentioned. That is to say, instruction is a set of events that is designed to <u>support</u> learning, in any or all of the four ways suggested by these categories. Variations in the nature of these events, or in the extreme case, in their presence or absence, may therefore be expected to have an effect on student learning, and accordingly on the changes in student performance which are taken as indicators of that learning.

Events supporting learning form a category of independent variable which is quite distinct from such entities as "modes of instruction," "teacher behaviors," or "teacher characteristics."

<u>Modes of instruction</u>. The way instruction is organized, as in small groups, large groups, lectures, homework, discussion classes, and so on

(sometimes called "teaching strategies") is a distinctly different dimension from that of learning-support events. How the latter events are made to occur is more or less independent of how student-teacher interactions are arranged. In any given mode of instruction (for example, a teacher with a small group) these events may occur sometimes, and sometimes not. How they occur can also vary within any given mode of instruction.

Teacher behaviors. The behaviors of teachers, such as "type of questioning," "amount of talking," "use of criticism," "non-directive communication," and the like, are clearly not identical with the events that support learning. A teacher's talking, for example, may be essential as an event which introduces the learning, but on some occasions unsupportive as a learning guidance event. Inappropriate teacher talking may be detrimental to the conduct of a review exercise when retention is called for, but talking to provide informational feedback may furnish an important kind of support for learning. Thus, according to the learning-support notion, one cannot assess this variable simply by counting the frequency of teacher talking. The relation of this talking to learning processes is the crucial matter.

Teacher characteristics. Obviously, too, the events that support learning are quite distinct from the characteristics of teachers, such as "warmth," "authoritativeness," or "knowledge of subject matter." Were an indirect indicator of teacher characteristics to be proposed as related to learning support, it would have to be something like "knowledge of how a teacher can support learning."

Summarizing these points, I propose that teacher strategies, teacher

behaviors, and teacher characteristics become relevant variables which may make a difference to student achievement only when they are considered as events that support learning processes. Some of the latter events are provided by printed materials, and some by the learner himself. The remainder are made to occur by the teacher, usually by oral communication. One can identify these behaviors as relevant variables only by considering what effects they may have on the learning that is taking place.

Method

I shall describe the method employed in my observational study very briefly, in view of the time available.

I used a blank tabular form to record the school, the time of day, the subject matter of the course or session, and other essentials of this nature. Then there was a column entitled "to be learned" in which I recorded either what was announced as the lesson objective, or what I inferred it to be. Still another column was headed "assessment" in which was recorded either the observed mode of assessing outcome (such as teacher questioning) or the information I later obtained from the teacher about his expected means of assessment. A final column was left for my recording of the nature of learning support which I inferred was being addressed by the events. In this column I attempted to answer the question, what features of the events are promoting learning, and in what ways?

These observations were made in a number of schools on a number of different days, including grades from one to twelve. Usually, I simply sat in the back of the room, in as unobtrusive a manner as possible. Sometimes I asked a student a question about what he was doing, and on

occasion the teacher, in each case without interrupting the activity of other people.

I had to decide something about the unit of observation, for recording purposes. I decided to call it the "learning interval," defined as that single interval of time in school during which one student, or any group of students, engage in activity having a common goal for the outcome of learning. Thus, in the elementary grades a learning interval might refer to the period of time during which three students in the fourth grade worked together to construct a model airport; or it might refer to the time during which a single student worked on problems in a workbook involving the multiplication of two-place numbers. In the higher grades, a learning interval might be that part of a class period during which students wrote paragraphs in French from dictation.

One additional feature of the structuring of observations needs to be mentioned. Recall that I wished to record "what is to be learned," without necessarily having available clear statements of instructional objectives. In doing this, I have had in mind a set of categories of learning outcomes drawn from my previous writings (Gagné, 1972, 1973). I found it easily possible to identify the expected outcomes of the learning as verbal information, intellectual skills, cognitive strategies, attitudes, or motor skills. This is not to imply that any given class period, or learning interval, may not have had secondary objectives as well as primary ones. The objectives, however, could always be classified in terms of these five kinds of learning outcomes.

Results and Conclusions

I shall be able here to present only some of the most general conclusions from the study. Of course, it is an exploratory study, and I have no data to indicate the relation of the learning-support events I observed to student achievement measures. What the results can reveal, perhaps, is something about the feasibility of this method of observation, and something about its sensitivity to what may turn out to be critical independent variables. In addition, some general trends of the data, and their implications for the idea of learning support, may be indicated.

Conclusions about Methodology

1. Observations of the sort I have described are not difficult to make and record. Since they refer to events that occur over minutes of time, the recordings can be done in ordinary note-taking language, and thus require no special coding. Trained observers, however, are required. They must be able to distinguish classes of learning outcomes (intellectual skills, attitudes, etc.). They must also have a well-understood set of categories of phases of learning, such as those I mentioned at the beginning -- that is, they must be able to distinguish whether the events are aimed at introducing the learning, at guiding it initially, at reviewing and elaborating it, or at providing feedback. Quite probably, finer divisions than these need to be devised for the phasing of events supporting learning processes.

2. The reliability of observations of this sort needs to be determined. It may be noted, however, that the categories being recorded -- both of learning outcomes and learning phases -- are grossly distinctive;

at least, they appear so to me. I should judge, therefore, that suitably trained observers could achieve high reliability.

3. It appears that my observations on what I called "assessment" are defective mainly in their incompleteness. The importance of this class of events lies in its relevance to feedback, or reinforcement. Thus, the record that a quiz is to be given next week on the outcome of a given learning interval (a not uncommon observation) is inadequate. In order to appraise the quality of learning support, one must, I'm afraid, find out what performance the quiz required and what specific feedback it provided.

Conclusions about Instruction

1. From about the sixth grade upwards, a notable generalization is that learning intervals that take place in school are only seldom concerned with initial learning, particularly with those events I described as "guiding the learning." The vast majority of instructional time in school is concerned with events designed to support retention and transfer. Of course, in lower grades, the concern with initial learning is much greater in frequency. One general implication is that learning research, if it is to be relevant to school learning, should perhaps devote more of its attention to finding the optimal conditions for retention and learning transfer.

2. A corollary to this set of observations is that, from the sixth grade on, a great deal of instruction is self-instruction. It is accomplished in homework, in which the student interacts with a textbook. I speculate that homework has come to be an essential feature of school instruction largely because in this way the initial learning can be "individualized" -- the student can study at his own rate, using his own

resources. In contrast, on those infrequent occasions when the teacher tries to guide initial learning in a whole class, the difficulties are highly apparent, and reveal the need for "individualized instruction."

3. Inappropriate instruction, and therefore instruction that is less effective than it should be, can be seen to occur, irrespective of the warmth or conscientiousness of the teacher. In my view, intellectual skills cannot be effectively taught like motor skills, nor attitudes like verbal information. Yet systematic variations in instruction aimed at different classes of learning outcome cannot be observed with great frequency.

4. If there is one aspect of instruction that stands out as being often missing, it is appraisal followed by feedback. It seems to me this is a highly critical part of each act of learning. Yet the procedures for it are either highly inadequate, or else teachers don't often bother to use them. Of course, quizzes and examinations are given, but their relation to what has been learned often appears remote. Perhaps the whole business of "testing," in whatever form, has become too formal and too complicated a procedure. In that case, we may need other techniques which can readily be used to find out what students have learned, and when their learning of any given objective has been completed.

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